Flowing Waters: Efficient Water Billing Management with SMS Notifications in Laravel

Ghandi B. Galila

Faculty, College of Engineering and Information Technology,
Surigao Del Norte State University, Surigao City, Philippines

Abstract: Flowing Waters is an all-encompassing water billing management solution developed using the Laravel framework. Designed to be user-friendly, it empowers water utility companies in efficiently managing customer data, monitoring water consumption, and generating precise bills based on actual water usage. With the integration of SMS notifications, customers receive timely billing updates, leading to a decrease in late payments and an overall improvement in revenue collection. The system's advanced security features safeguard sensitive information, ensuring smooth operations and heightened customer satisfaction in water billing procedures.

Keywords: Flowing Waters, Water billing management, Laravel framework

REFERENCES

[1]. Mohanty, S. P., Choppali, U., & Kougianos, E. (2016). Everything you wanted to know about smart cities: The Internet of things is the backbone. IEEE Consumer Electronics Magazine, 5(3), 60-70.

[2]. Harrison, C., Eckman, B., Hamilton, R., Hartswick, P., Kalagnanam, J., Paraszczak, J., & Williams, P. (2010). Foundations for smarter cities. IBM Journal of research and development, 54(4), 1-16.

[3]. Ercan, T., & Kutay, M. (2021). Smart cities critical infrastructure recommendations and solutions. In Solving Urban Infrastructure Problems Using Smart City Technologies (pp. 503-541). Elsevier.

[4]. Fu, B., Horsburgh, J. S., Jakeman, A. J., Gualtieri, C., Arnold, T., Marshall, L., ... & Rashleigh, B. (2020). Modeling water quality in watersheds: From here to the next generation. Water resources research, 56(11), e2020WR027721.

[5]. Sharpley, A. N., Bergström, L., Aronsson, H., Bechmann, M., Bolster, C. H., Börling, K., ... & Withers, P. J. (2015). Future agriculture with minimized phosphorus losses to waters: Research needs and direction. Ambio, 44, 163-179.

[6]. Kolditz, O., Berendonk, T. U., Chen, C., Fuchs, L., Haase, M., Jungmann, D., ... & Walther, M. (2019). Managing Water Resources for Urban Catchments. Chinese Water Systems: Volume 2: Managing Water Resources for Urban Catchments: Chaohu, 35-85.

[7]. Jäger, M., Schwarz, M. M., Auer, D., Platzer, B., & Küng, J. (2017). Connecting small, private & independent hydro power plants to increase the overall power generating efficiency. Procedia Computer Science, 109, 841-848.

[8]. Jägera, M., Schwarzb, M. M., Auera, D., Platzerc, B., & Künga, J. JOURNAL: Connecting small, private & independent hydro power plants to increase the overall power generating efficiency.

[9]. Józefowicz, I., & Michniewicz-Ankiersztajn, H. (2023). Digital Tools for Water Resource Management as a Part of a Green Economy in Rural Areas. Sustainability, 15(6), 5231.

[10]. Asante, M., Epiphaniou, G., Maple, C., Al-Khateeb, H., Bottarelli, M., & Ghafoor, K. Z. (2021). Distributed ledger technologies in supply chain security management: A comprehensive survey. IEEE Transactions on Engineering Management, 70(2), 713-739.

[11]. Mather, T., Kumaraswamy, S., & Latif, S. (2009). Cloud security and privacy: an enterprise perspective on risks and compliance. " O'Reilly Media, Inc.".

[12]. Ogonji, M. M., Okeyo, G., & Wafula, J. M. (2020). A survey on privacy and security of Internet of Things. Computer Science Review, 38, 100312.

[13]. Ahmad, R. W., Salah, K., Jayaraman, R., Yaqoob, I., & Omar, M. (2022). Blockchain in oil and gas industry: Applications, challenges, and future trends. Technology in society, 68, 101941.

[14]. Kumar, P., Lin, Y., Bai, G., Paverd, A., Dong, J. S., & Martin, A. (2019). Smart grid metering networks: A survey on security, privacy and open research issues. IEEE Communications Surveys & Tutorials, 21(3), 2886-2927.

[15]. Teng, S. Y., Touš, M., Leong, W. D., How, B. S., Lam, H. L., & Máša, V. (2021). Recent advances on industrial data-driven energy savings: Digital twins and infrastructures. Renewable and Sustainable Energy Reviews, 135, 110208.

[16]. Alam, T. (2021). Cloud-based IoT applications and their roles in smart cities. Smart Cities, 4(3), 1196-1219.

[17]. Xia, L., Semirumi, D. T., & Rezaei, R. (2023). A Thorough Examination of Smart City Applications: Exploring Challenges and Solutions Throughout the Life Cycle with Emphasis on Safeguarding Citizen Privacy. Sustainable Cities and Society, 104771.

[18]. Rogers, P., De Silva, R., & Bhatia, R. (2002). Water is an economic good: How to use prices to promote equity, effPimentel, D., Berger, B., Filiberto, D., Newton, M., Wolfe, B., Karabinakis, E., ... & Nandagopal, S. (2004). Water resources: agricultural and environmental issues. BioScience, 54(10), 909-918.

[19]. iciency, and sustainability. Water policy, 4(1), 1-17.

[20]. Soegoto, E. S. (2018, August). Implementing Laravel framework website as brand image in higher-education institution. In IOP Conference Series: Materials Science and Engineering (Vol. 407, No. 1, p. 012066). IOP Publishing.

[21]. Győrödi, C., Győrödi, R., Pecherle, G., & Olah, A. (2015, June). A comparative study: MongoDB vs. MySQL. In 2015 13th International Conference on Engineering of Modern Electric Systems (EMES) (pp. 1-6). IEEE.

[22]. Steel, C. (2012, November). Fitting learning into life: Language students' perspectives on benefits of using mobile apps. In ascilite (pp. 875-880).

[23]. Tao, D., Yang, P., & Feng, H. (2020). Utilization of text mining as a big data analysis tool for food science and nutrition. Comprehensive reviews in food science and food safety, 19(2), 875-894.

[24]. Chandler, R. C. (2010). Emergency notification. ABC-CLIO.

[25]. Ray, P. P. (2016). A survey of IoT cloud platforms. Future Computing and Informatics Journal, 1(1-2), 35-46.

[26]. Savova, G. K., Masanz, J. J., Ogren, P. V., Zheng, J., Sohn, S., Kipper-Schuler, K. C., & Chute, C. G. (2010). Mayo clinical Text Analysis and Knowledge Extraction System (cTAKES): architecture, component evaluation and applications. Journal of the American Medical Informatics Association, 17(5), 507-513.

[27]. Geetha, S., & Gouthami, S. J. S. W. (2016). Internet of things enabled real time water quality monitoring system. Smart Water, 2(1), 1-19.

[28]. Isaac, J. T., & Sherali, Z. (2014). Secure mobile payment systems. It professional, 16(3), 36-43.

[29]. Nambiar, S., Lu, C. T., & Liang, L. R. (2004, November). Analysis of payment transaction security in mobile commerce. In Proceedings of the 2004 IEEE International Conference on Information Reuse and Integration, 2004. IRI 2004. (pp. 475-480). IEEE.